OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

07951

Distr.
LIMITED

ID/WG.263/15
14 December 1977

ENGLISH

United Nations Industrial Development Organization

UNIDO/ECA Workshop on Technical Co-operation among the Developing Countries of Africa in the Field of Metalworking Industries

Addis Ababa, Ethiopia, 14 - 25 November 1977

METALWORKING INDUSTRIES IN TANZANIA 1/

by

S. A. Malai*

* Senior Industrial Engineer, TISCO, Ministry of Industry, Dar-es-Salaam, United Republic of Tanzania

1/ The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

id.77-8743

INTRODUCTION

The metals industry is defined, for the purpose of this report as that group of firms which uses as inputs the products of basic metals industry. These inputs are produced in the form of ingots, rods, bars, plates, sheets, angles, flats of metal both ferrous and non-ferrous by smelting plants and rolling mills. These inputs are used to manufacture hundreds of thousands of different engineering products to which can be added an infinite variety of uses for metals in the process of repairing and maintaining those products.

One of the main characteristics of an advanced economy, whether the country is socialist or capitalist, is the presence in the industrial structure of certain major industries which form the base for industrialization considering the basic needs of people, it can be seen that when these needs and the products which meet them are traced through to their origins, a core group of industries can be identified as indispensable to development. Central to the core group are the engineering and metal transforming industries, chemicals and construction industries and the power industry. Most needs require the application of power and machinery to raw materials in order to produce the equipment, buildings and systems by which the need can be met with goods and services.

The basic elements of economic development are labour, power, natural resources and capital. Of these three capital is the only one which is composed of outputs from the flow of production. Hence the products and services of the engineering industries provide the basis upon which all other industries can be undertaken and maintained. Without metal structure, industrial machines, components and repair services little industrial development can take place.

If industrialization is to lead to self-reliance then these essential products and services must, so far as is possible be generated in Tanzania. One test of genuine economic development is the emergence from a state of technological dependence. Development of the engineering and metal transforming industries is closely related to the process of learning and to the growth of indigenous technology. All engineering projects have this important common factor. They add to the capacity of providing continuous productivity growth; based on the acquisition of new skills, technological innovations, designs and adaptations, they foster the capability to generate continuous technological progress which is necessary for the development of a self-reliant modern industrial sector.

The importance of the rapid development of engineering and metal transforming industries must be further emphasized in the light of the proposed development of Tanzania's natural resources. The eventual production of semi-finished steel from Tanzanian deposits of iron-ore and coal is a prime example of the type of industrial development at which the industrial strategy is aimed. It will be essential however, if all the aims of the strategy are to be met, to provide an efficient home-market base for the industry. In order to do this steel using industries such as engineering, metal transforming and construction must be developed to the fullest extent possible before steel production commences.

Three types of production units are considered for this purpose of classifying the method of production:-

a) Small - Scale:- Workshop type units low-cost premises, few workers (say up to 20) and simple engineering equipment - e.g. under Small Industries Dev. Organization (SIDO).

b) Medium-Scale:- Middle sized engineering firms typified by National Engineering Co.Mang'ula Workshop essentially jobbing engineering works capable of quite large scale on-off projects.

c) Large-Scale:- Large, specialized engineering plants, no example in Tanzania would have production line method of manufactured engineering goods-e.g. road building equipment.

A large portion of these production units are located in the Coastan Region (mostly Dar-es-Salaam) and a few in Tanga, Arusha, Kilimanjaro and Mwanza.

<u>Problems of development of Metal Working Industry</u>

There are, numerous problems within the industry and there are also problems related to its expansion. And there is the question of choosing a method and strategy of developing the industry in a way most appropriate to Tanzania, and so that the problems are minimised. This section of the Report will review the major problems and consider some alternative policies for development.

a) <u>Scale and Diversity of the Industry</u>

There is a wide diversity of scales and types of productive activities which are necessary to create a fully developed industry. Small workshops, medium general engineering plants and large production factories must develop simultaneously if an industry - as distinct from isolated activities is to grow.

There is now question that it is the development of an industry and not the sponsoring of random activities, which must be undertaken in Tanzania in the immediate future. If we are to create the capacity to absorb a reasonable proportion of the steel output expected in the 1980's we cannot rely on village workshops, or on one or two large production plants, or a few jobbing and repair firms. We must exploit systematically potential development of all possibilities.

Perhaps more importantly for Tanzania, the only way to realize to the full the benefit of increased technological independence, which can be expected to flow from the development of engineering activities, is to ensure the growth of an integrated industry. An industry in which all possible sectoral links are being exploited and in which planning for the future is based on expanding those links, is likely to contribute much more to the learning process than an industry which grows haphazardly. However, while it is essential that careful planning be carried out it is not necessary to wait before commencing development of the industry. Already, as shown in the previous section, several areas can be readily identified as requiring more time, resources or other considerations before development begins. Thus, while the diversity of the industry and the development goals of Tanzania together create problems requiring a great amount of planning effort in their solution, no delay in developing the industry need occur. Expansion of production can be commenced while planning is carried out.

b) <u>Ownership</u>

Of the firms surveyed by the Task Force more than half were privately owned. Moreover, the Task Force include almost all the state-owned firms in the survey so the proportion of private firms in the whole industry is much larger than fifty per cent. Estimates indicate that close to 85 percent of the firms covered by Central Bureau of Statistics are privately owned.and operated.

Given that much of the present engineering activity, skills and knowledge are in the private sector, and that planned rapid expansion of the industry is imperative, some policy questions are raised. To exclude private activity completely would create an unnecessary and, perhaps, insurmountable lock to development in the short-run. It must be remembered that development of the industry will need to be rapid, if the objective of steel absorption is to be achieved in the time available. Second; not only could a clear role for private activity be defined, but that Government should hasten to do so. There was a clear impression that expansion and diversification plan in the private firms were overshadowed by uncertainty. Third, the important factor, is that the definition be clear. However constrained the Government may to impose on private operators the main requirement is that they are stated with <u>clarity</u>. Theoretically, there is no problem with regard to non-private ownership in the engineering industry. Small and medium firms may be owned and operated by cooperatives, medium and large firms can be covered by the parastatal system, probably by NDC small cooperatives needing assistance, may be aided by SIDO. Both NDC and SIDO have a wide range of interest outside engineering. Having made investments in one or two larger firms, NDC's interest in engineering outside those firms may be limited. Similarly SIDO while it has proved willing to help small cooperatives in the engineering field cannot limit its activities to this area alone and has somewhat limited resources in any case. Hence, the future structure of ownership in both private and non-private sectors of the industry is presenting problems to which policy must be directed, in this context finance is likely to be a particularly complex difficulty.

c) Training and Manpower Development - Human Resources

There is an indication of a shortage of trained manpower in the engineering industry. The shortage appears to affect all levels of training and skills. However, from plans by the Ministry of Manpower Development, on middle and high-levelmanpower requirements indicate that demand for technicians may be met between 1980 and 1985.

The previous data supplied by Manpower Planning are as follows:

Occupation	Expected shortfall	Expected Surplus
Mechanical engineers and similar profession	426	
Electrical engineers and similar profession	165	
Economists	397	
Accountants (Prof)	330	
Administrators, Managers, Directors	368	
Electrical Engineering Technicians and similar professions		85
Accountants (Non-Professionals)	377	
Mechanical Engineering Technicians and similar professions		26

With the industry, rapid growth will be constrained by shortage of manpower, including technicians, and that considerably more needs to be learned about the manpower situation than is now known.

d) Materials and Equipment Supply

Tanzania imports almost all her iron and steel basic raw material needs, namely bar, sheet, tube, wire, rails, simple semi-finished and finished products like nails, finished structural parts hoes, hand tools, intermediate finished products like tanks, buckets, locks, springs and other products with import substitution possibilities like bicycles, trailers, railway freight cars, machine tools etc.

The raw materials, used by engineering industries are supplied by the Steel Rolling Mill in Tanga and the National Steel Corporation which is stockholder or are directly imported by the user e.g. tinplates for cans, steel for hoes, billet for rolling etc.

The supply problems encountered by engineering firms in Tanzania are caused by both internal and external factors.

a) Current World shortage of steel which is magnified by domestic problems of delay due to bureaucratic import licencing procedures, delays in the port and lack of procurement experience.

b) Overstocking by some firms and temporary shortages by other also lead to supply problems.

c) Local distribution of steel products has caused supply disruptions to building contractors and engineering industries because of limited capacity of stockyard of the National Steel Corporation. It has a maximum capacity of 7,000 tons which is inadequate for the current requirements.

d) Lack of a stock list catalogue for industrial machines and tools, namely drills, taps, milling outlets etc held by the State owned Agricultural and Industrial Suppliers Co.Ltd for use by customers throughout the country.

e) Shortage of precision measuring instruments and metallurgical testing equipment in factories and technical schools. These instruments/equipments are required for control of high speed machinery, spare parts, drive shafts, etc. The creation of the National Standard Institute will probably raise the quality of engineering products and permit these products to be exported at a later stage.

Import supply problems have been reduced by setting up steel scrap melting furnace at ALAF which recycle domestically generated scrap metal. It is estimated that 6 - 7000 tons of recoverable steel is being generated every year in Tanzania.

This paradox is brought about by the setting up of comprehensive workshops in many government institutions in which much of the equipment lies idle either for lack of internal work, or lack of manpower. On the other hand many firms could expand and diversify their activities considerably by the purchase and installation in some location in which equipment sharing was possible. It may be necessary to plan the use of engineering equipment on an industry wide basis in order to ensure reasonable economic utilization.

e) Capacity Utilization and Efficiency of Production

The majority of engineering firms work on one shift basis and overall capacity utilization has been estimated to be 35 - 50 per cent of what could be achieved under normal conditions. Capacity underutilization is due to lack of managerial personnol and skilled workers, supply disruptions and narrowness of the local market. The efficiency of local production is shown by the following analysis of the structure of production costs (input) of the engineering industries covered by the 1971 survey of Industrial Production.

	Materials %	Labour Costs	Overheads and Selling Costs
i) Fabricated Metal Products	58	14	28
ii) Mechanical Machinery and Equipment	41	23	36
iii) Electric Apparatus and Equipment	72	8	20
iv) Transport Equipment	47	8	45

Hence: i) Fabricated metal products, like cutlery, furniture and fixtures, structural metals, nuts, bolts, containers, agricultural implements, wire products.

ii) Machinery, other than electric, under this category industrial and agricultural machinery, engines, machinery and equipment for mining, pumps and compressors.

iii) Electrical machinery, apparatus and appliances, covers assembly activities mostly of radios and gramophones and the manufacture of dry batteries.

iv) Transport equipment, includes the assembly of SKD trucks and tractors and the manufacture of steel bus, trailer and truck bodies.

Although the breakdown of costs for individual commodities within the four categories may be difficult, it would, however seem that the domestic value added component in metal fabrication and in the production of mechanical machinery is probably much greater than in the assembly of radios and transport equipment which make up the bulk of the value of output in the electric apparatus and transport equipment industries. The principal raw materials (steel and aluminium) used in the four sectors have to be imported. If it were possible to acquire all the required skills for the industrial sector, including a disciplined labour force and competent management, then we could possibly say that the share of wage costs in total production costs will provide an indicator of the economies that may be achieved through import substitution. It follows therefore that it is not easy to determine the efficiency of local production as compared to imports. It is even more difficult when factors like raw materials price instability and their different sources of supply or quality of products are taken into consideration.

MAINTENANCE AND REPAIR OF MACHINES

If one defines maintenance as the total of activities serving the purpose of retaining the production means in or restoring them to the state that is considered necessary for fulfullment of their production function one finds that it is practically impossible to find any plant or machine that does not need maintenance. Yet, according to our experience, too many people design, manufacture, sell, buy and use machines and plants without giving maintenance the consideration its importance justifies. This fact might depend on insufficient knowledge about the nature of maintenance, but is also in many cases a conscious suppression of inconvenient information.

The lack of knowledge about the influence of maintenance on the total cost for production is to some degree understandable because in most cases the maintenance situation is not clearly documented in the records of an enterprise. To most accountants the maintenance cost is an unknown mixture of labour cost, spare parts cost and overhead. The indirect costs are unknown as well. For decades the accountants were allowed to make their cost records for accounting purposes only. First when modern management control systems were introduced, the maintenance and production managers were given a suitable tool to reveal and control the direct and indirect costs of maintaining the equipment.

Many plants and machines have been decided on without the full and complete knowledge of the future maintenance costs. Complete factories have been delivered from industrialized countries without spare parts and necessary information about the absolute minimum of maintenance activities to keep the factory running at the desired capacity and quality level. It may not be possible to prove, but surely some investments have been made, that would have been rejected, if the full cost situation had been revealed at the tendering stage.

The true fact is, that it is impossible to have any kind of industrial production without maintenance, but only justification for maintenance is—— production. A consequence of this fact is, that both the production function and the maintenance function should be involved in all activities concerning a machine or plant, from the first discussions about possible production process and possible machine or plant alternatives. If the chosen plant or machine has such qualities, that much maintenance is required to keep it running at the desired capacity and quality level, the production function undoubtedly will encounter difficulties.

With an increasing complexity of machines the cost will increase and also consequently a higher amount of invested capital per production worker. As there are no production workers in the future fully automated factory there is no limit on the amount of invested capital, when this is related to the production worker.

These facts are too often overlooked, especially by production managers. They do think these line, and in many cases there is nobody who takes the importance of maintenance in consideration. Conclusions from these two figures must be, that the importance of maintenance is continuously increasing in a developing industry.

For the production man the most important aspect is to have machines running as much as possible. Every single break in the production means to him a loss of production time. When a breakdown comes and his machines are stopped he believes the most important matter is to get someone to have the machine repaired as fast as possible. He often wants repair done on a temporary basis so that the machine is "fixed" in one way or another, in order to start production again after the shortest possible time. If there is a delay, perhaps because an important spare part is missing, he is upset and tries in every possible way to get the machine in order again. What is meant "in order" is not the same as what the maintenance man considers to be.

This view on maintenance is ofcourse not correct. Any production man will have to realize, that he has to look on the total production. Also in most cases the quality of products depends on the condition of the machine, machines in good condition produce a better product.

When a breakdown occurs the condition of the machine is lower than it is supposed to be. The condition must be kept or maintained on a certain level. If the condition is lower than required for a certain level of production the output of the machine is smaller than is scheduled and/or the quality of the product lower than what is acceptable.

The production man should look on maintenance as something of value to him and to production. A good maintenance system maintains the production capacity and at the same time the machine in such a way that the quality of the produced is not dropping under a pre-determined value. The maintenance man must be granted sufficient time to do the necessary work to achieve this result. And that time must be taken from the ordinary 24 working hours per day. Maintenance takes time and is unavoidable. Production time must therefore under all estimates be under 24 hours per day as an average over a certain period of time.

These facts will have to be recognised by everyone in industry. Coming back to the situation when a breakdown occurs. The essential question to the production man is, when will it be possible to bring the machine back in good operating condition? Not in operating condition but in good operating condition. And when can production start again, not when does the maintenance man start to repair the machine.

Several examples from experience can be given when planning the repair in a breakdown situation, before the actual repair of the machinery is started, leads to a shorter stop time as compared with the same situation when the repair job started without planning. The reduction in repair time may be as big as 50%. The production man will have to rely on the maintenance man and let him, being the maintenance craftsman and the one and only responsible specialist, plan and conduct his work in his own way. To an outsider it might look as negligence when a repair man sits down and thinks before he starts working. To a trained man this way is the best one, and the one way that will lead to the shortest possible stop time for the broken down machine.

Another aspect where there seems to be some disagreement between the production man and the maintenance man is the question about the kind make and type of machine, to be purchased. The production man usually will ask for the best possible rated production values and the purchaser for the lowest price. In too many cases the maintenance man's opinion is not even asked for.

The result is, that the maintenance man may have a lot of additional problems to keep the machine in running condition, spending a lot of money and time on repairs and maintenance operations, which could have been avoided. The reason for this is, that the machine is not designed and built to give a good production with as little maintenance as possible. When the design of the machine was negotiated with the manufacturers the production man talked about production per hours, and the purchase man about the price. But no one talked about, how many hours annually the machine has to be stopped for maintenance. The main problems in the field of maintenance are:

1. Too few managers and government officials know enough about the effect of maintenance on production.

2. Too few people know about the nature of maintenance and how maintenance should be controlled.

3. Too few people are aware of the need for conditions training programmes for maintenance craftsmen and naturally for production operators.

4. Maintenance is not regarded as a specific discipline, which in fact it is.

5. People, who do not know about maintenance in a modern sense try to run maintenance without knowing what they really do.

6. Preventive maintenance programmes are neglected, sometimes even stopped by higher management.

7. Too little attention is paid to the maintenance questions and problems at the tendering stage. Too few maintenance managers have the necessary documentation to be in a position to provide the necessary assistance at the tendering stage.

TECHNOLOGY TRANSFER

In order to deal with the problems that arise it is necessary to refer to the present situation of technology in the industrialised countries. This situation can already influence and without doubt will influence in the future, the various phases and aspects of its transfer.

If we define technology as being the set of those production methods equipment and products in which technological knowledge finds its economic application, then a transfer of technology occurs when industrial products, or productive processes, or methods of production and therefore management methods, are transferred from the environment in which they originated to a different one.

A transfer of technology as defined above may thus take place from one country to another or within the same country. What we must consider here in more detail is the transfer of technology between countries with different levels of industrial development.

The tranfer process may be outlined (with a drastic simplification of the reality) as a succession of different phases. Fig.1 shows the situation prevailing today. The first phase is usually an economic evaluation of the possible alternatives and takes into account for example, factors such as the cost and availability of raw materials the cost and availability of manpower, the size and dynamics of the market in which it will operate, the cost of the technology to be transferred, the time required for the tranfer and the possibility of financing.

The results of the evaluation normally become the main elements which determine the choice of the technology to be transferred.

The subsequent tmansfer includes in the more usual cases an actual physical transfer of machinery, equipment products and in the case of a new industrial plant, the start up of the plant itself.

Normally a transfer of technology also involves transfer of organization and training systems. This is one aspect which tends to be rather left aside in the initial phases but which today is very often unavoidable If one takes the case of a new production plant in addition to the transfer of equipment and machinery there is a transfer of purchasing and marketing management methods, methods of organization of production of stock control and inventory management and of personnel training.

It is generally recognized that a tranfer of technology that follows the pattern briefly described above frequently leads to difficulties which may be very serious and may even cause non reversible damage to the social and economic structures of the recipient country.

One of the principle causes of such difficulties stems from the too limited and restrictive criteria used during the initial evaluation. Fig.2 shows the three areas in which a man's principal activities are carried out these have been given the over simplified denominations of social-environmental systems, organisation educational system and technological industrial system. The situation that prevails today is the consequence of the priveleged position of the technological industrial system which is characteristic of the industrialized countries. The investment evaluations which utilize the resource available for implementation a new technology tend to optimize the technical-industrial system only marginally taking into account the other areas of human activity. In other words a short term economic optimization is made.

In addition it is technology that influences the other systems rather than vice versa. A new industrial plant for example changes the society and environment in which it is placed and frequently the organizational - educational structure too. Examples of influences in the opposite direction are very limited.

The situation might be improved by extending the area of optimization on the basis of which the technology to be transferred is evaluated as in the second part of fig.2. It must be remembered that the ultimate aim of technology and today that is admitted and recognized by all currents of opinion, is to improve the social and environmental system. In other words a situation must be created in which the three systems are optimized together with prevailing influences that are more balanced and consistent with the ultimate aim of the systems themselves.

From the economic point of view an overall evaluation of technology is equivalent to a long term optimization. The principal difficulty is that one cannot always give a money value to social or environmental benefits.

A possible improvement in the pattern of the transfer of technology is suggested in fig.3 a distinction is drawn between the phases of overall evaluation and economic evaluation. In order to take into account the difficulty mentioned above, these two phases ought to have a parallel development and influence each other continuously. The practical impossibility of using the new classic methods of economic evaluation for the long term evaluation involves the use of different methodologies that underline the political aspect of the possible choices.

For this reason it is necessary for a country which is in the process of industrialization to dedicate more resources and often more time to the overall evaluation and, frequently to the forecasting of the country's development.

An example of the possible broadening of the criteria of evaluation and choice may be obtained by looking at one of the economic parameters used in reaching decisions about new production plants the relation between annual value and investment. The maximization of this parameter is a simple optimization in only one dimension and it therefore leads itself to a quite easy choice.

If we consider this relation as the product of two parameters employment/investment and annual added value/employment meaning by employment the number of jobs needed for the operation of the new plant we obtain partial indices to be optimized in accordance with the employment situation in the country which is receiving the plant. One may also try to obtain a sound economic result by varying the two partial parameters obviously the resulting technology may differ from that which originated in an industrialized country.

From these considerations there appears another aspect which must be taken into account in order to improve the process of transferring a technology, the need to re-elaborate it so that it will be better adapted to local conditions. This re-elaboration which may be more or less important, requires the contribution of the country receiving the technology. Indeed the aid and the assistance of the country of origin can be no more than useful in this phase in no case can they replace the efforts of the receiving country. Any scientific and technical research in the industrializing country could usefully be oriented in this direction.

An obvious example is the approach to be followed for the maintenance of a new industrial p[illegible] suggested. For countries in the process of industrialization frequently far from the source of spare parts it may be reasonable to reduce the complexity and degree of automation of a plant in order to increase its reliability.

Together with the re-elaboration of the technology to be transferred it is wise to make a re-elaboration of the organizational and training system so that they will take into account the requirements and the general situation of the country receiving the technology. The two kinds of re-elaboration shown in fig 3 should be performed contemporaneously and not, as often happens at present, one after the other. Here too the aim is to have reciprocal influences, in order to prevent technology assuming once again a position of privelege.

It is clear that the model proposed for the tranfer of technology costs more. Nevertheless it is more probable that it will cost more in the short term but substantially less in the long term. A technology chosen on the basis of broadened criteria and suitably re-elaborated will very probably be more appropriate to an original development of the receiving country.

Today, industrially developing countries have a great opportunity. They can profit from the experience of the industrialized countries but critically without repeating their mistakes. To be able to do this, the most important resources needed are creativeness and reflection resources which by their nature are much more evenly distributed among the nations than others such as raw material and capital.

PHASES

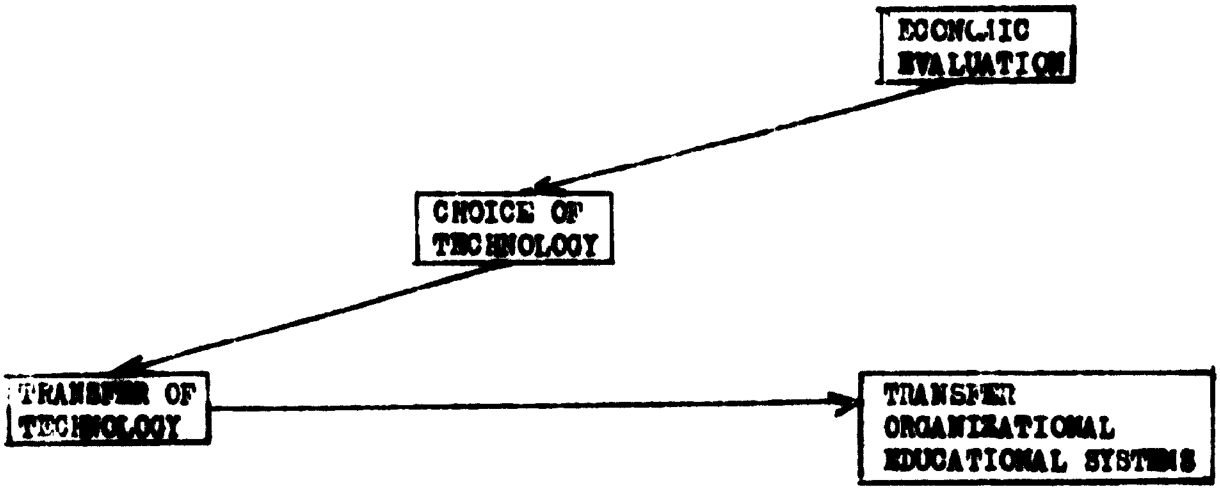

Fig.1 Diagram of the transfer of technology situation prevailing today

OVERALL EVALUATION OF TECHNOLOGY

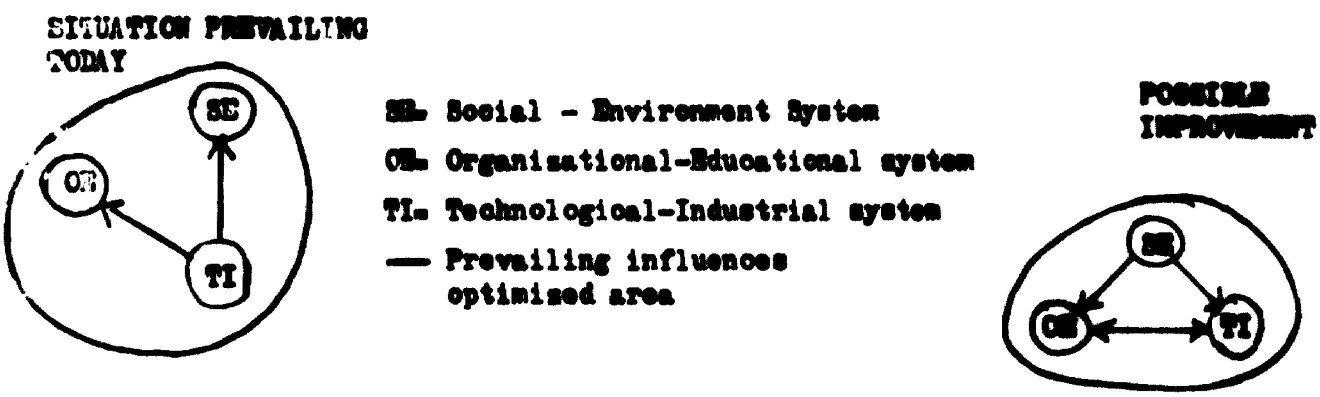

Fig.2 Evaluation of technology present situation and possible improvement

PHASES

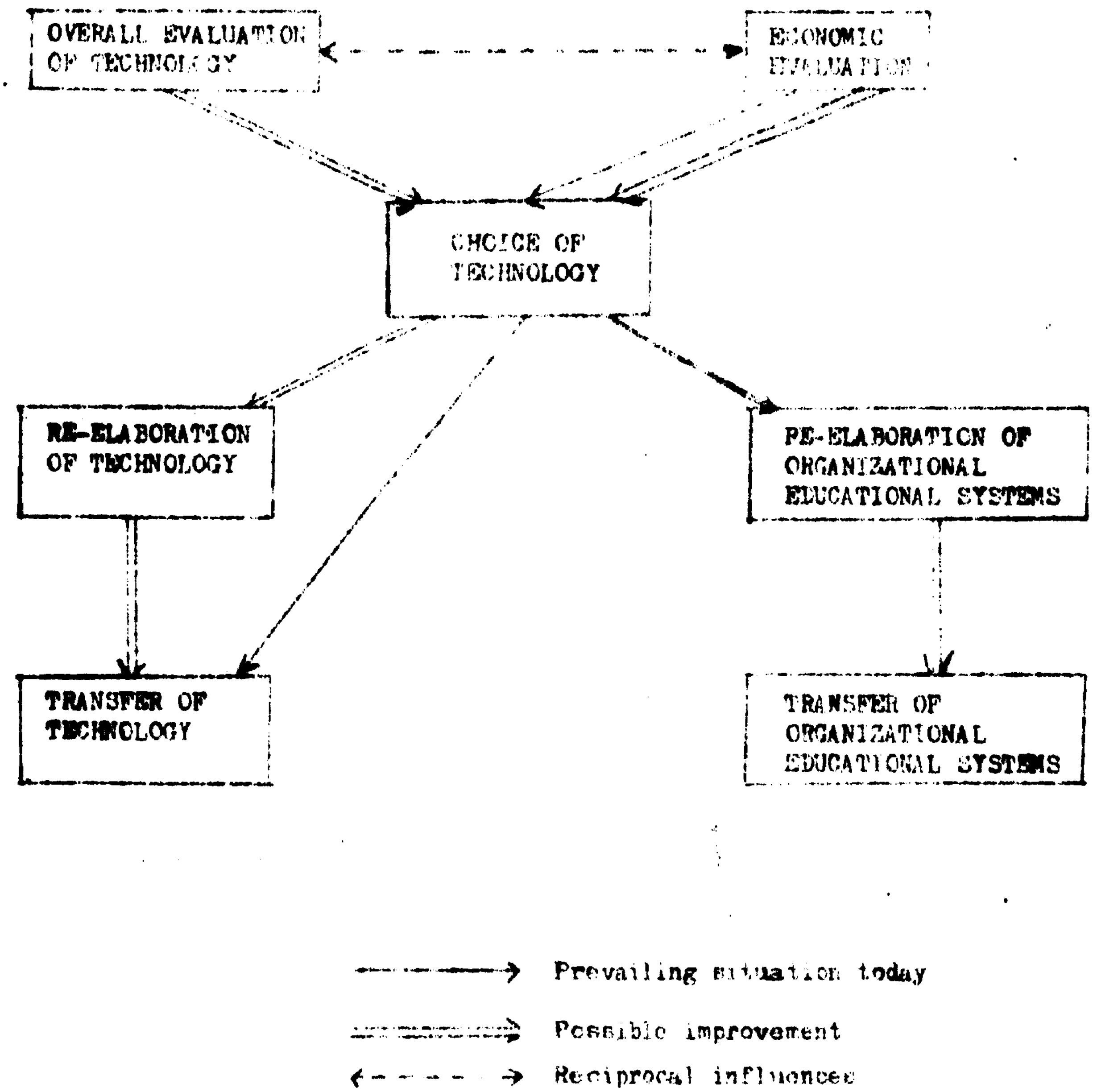

Fig.3 Diagram of the transfer of technology-possible improved model

Type and Volume of Technical Assistance Required from UNIDO

It is hoped that the iron deposits in L'ganga will be exploited by the year 1980. From then a certain production level of iron ingots and billets to supplied to the ingot rolling mill in Aluminium Africa and S. Rolling mill Tanga. These are specific ingots which will substitute imports (Tanga) and complement the Scrap. (Aluminium Africa) foundries in Sido, NECO, Mang'ula, and Tazara. A secondary production activity should be initiated to produce basic tool steel and alloy to steer up the industrialisation in the production of all kinds of tools. Cutting tools and production tools etc.

Steel complex has to be manned by competent personnal with thorough knowledge. Hence engineers should be trained further in a specialised field of metallurgy.

Most of metal industrial lack the common material science laboratory facilities. To elevate the quality of metal industries products the

- Hardness testing machine
- Tensile strength machine
- Fatigue failure testing units
- Microstructure testing units etc

have to be provided in aid of UNIDO.

Recommendation for the development and Improvement of Metal Working Industries to meet present and future demands for the general process of Industrialisation

In the long term Industrial strategy for the metal working sector, the task force set up to make a second analysis and subsequently recommendations, came up with the following:

1. Two institutions to be formed. One, a section of the Ministry of Industries devoted to coordinating and planning for the industry. The second, an Engineering Industry Association in which all firms in the industry will participate.

2. The immediate strategy should be a dual one:

   a) Commence immediately on these activities which require no further general planning and are consistent with the general aims of developing the industry.
   Import substitution by existing firms
   Use of underutilised capacity in existing Workshops
   Setting up commercial spares manufacture for major industries e.g. textiles
   Establishment of regional jobbing shops

   b) Preparation of detailed plans for dealing with problems of ownership, materials, protection, training and finance.

Value of Gross Output (1969-1974) in Million Shs Current Prices

Table 1

ISIC	Industrial Sector	1969	1970	1971	1972	1973	1974	% of Total Engineering only 1974
371	Basic Metal Ind.)	84.3	101.1	72.3	86.2	119.4	190.2	
	)			79.5	89.3	110.0	148.7	[illegible]3.62%
372	Incl rolling)							
381	Fabricated Metal Products)							
382	Machinery (other than electric)			19.9	25.96	25.2	26.2	5.92%
383	Electrical Mach. Apparatus Appliances	29.2	42.8	34.1	46.49	74.9	78.2	17.68%
384	Transport Equip,	110.9	68.2	97.3	112.61	169.2	189.2	42.77%
Total engineering plus basic metal		224.4	212.1	303.1	370.56	498.7	632.5	
Total engineering only		-	-	230.8	284.36	379.3	442.3	100%
Total engineering manuf.Ind.		1522.6	1744.4	2012.9	2516.04	3045.3	3887.5	
Engineering plus basic as of total manuf.		14.7	12.1	15.0	14.72	16.37%	16.27	

Source: Survey of Industrial Production 1969,1970,1971,1972,1973, 1974

Value added (1969 – 1974) in shs. Million Current Prices:

Table 2:

ISIC	Industrial Sector	1969	1970	1971	1972	1973	1974	% of Total Engineering only 1974
				Total Value added				
371	Basic metal ind.	20.5	23.6	12.4	16.0	28.9	32.7	
381	Fabricated metal than electirc			22.8	25.3	26.3	34.7	31.63%
383	Electrical Mach. apparatus	7.2	13.4	8.3	9.7	5.8	9.4	8.57%
	appliances			5.7	10.0	23.1	22.0	20.05%
384	Transport equip.	41.0	14.0	15.6	29.6	34.5	43.6	39.74%
Total engineering plus basic metal		68.7	51.0	63.8	90.60	118.6	142.4	
Total eng. only		-	-	51.4	74.60	89.7	109.7	100 %
Total all manuf. Ind.		475.4	560.6	642.8	678.84	914	1156.6	
Eng. plus basic as % of total manuf.		14.5	9.1	9.9	13.34	12.97%	12.31%	

Source: **Survey of Industrial Production**, 1969, 1970, 1971, 1972, 1973, 1974.

Table 3: Employment 1969 – 1974 — Total number employees.

ISIC	Industrial Sector.	1969	1970	1971	1972	1973	1974	% Total Engineering only 1974
371	Basic metal Ind. incl. rolling	1,350	1,266	500	569	610	888	
381	Fabricated Metal products		1,987	1,929		1978	2256	42.57
382	Machinery (other than electric)	563	871	511	513	680	721	13.58%
383	Electrical Mach., apparatus, appliances			337	509	748	761	14.34%
384	Transport equip.	802	771	975	1,301	1456	1565	29.49%
Total Engineering plus basic metal		2,715	2,908	4,310	4,821	5472	6194	
Total Eng. only		-	-	3,810	4,252	4862	5306	100.00%
Total All Manuf. Ind.		43,393	48,314	53,516	62,188	70,315		
Eng. plus basic as % of total manuf.		6.3	6.0	8.0	7.8	5.58%	5.81%	

Source: Survey of Industrial Production 1969, 1970, 1971, 1972, 1973, 1974.

Note: Table covers firms with ten or more employees only. Employment covers all paid workers i.e. operations, admin., personnel, supervisory, technical and clarical of except working proprietors and unpaid family works.

Table 4 **Labour Costs 1969 - 1974 (in Shs. millions current prices)**

ISIC	Industrial Sector.	1969	1970	Total Labour Costs 1971	1972	1973	1974	% of Total Engineering only 1974
371	Basic Metal Ind.			3.2	5.26			
372	incl. rolling	8.0	7.6			5.1	7.6	
381	Fabricated metal products			11.3	12.58	14.8	20.4	39.84%
382	Machinery (other than electric)	3.9	6.8	4.8	5.34	6.1	6.7	13.08%
383	Electric Mach., apparatus, appliances			2.7	3.87	6.4	7.0	13.67%
384	Transport equip.	6.4	6.2	8.1	12.69	14.4	17.1	33.39%
Total eng. plus basic metal		18.3	20.6	30.1	39.64	46.8	58.8	
Total eng. only		-	-	26.9	34.59	41.7	51.2	100.00%
Total all manuf. Ind.		214.6	240.2	261.1	326.8	401.5	512.6	
Eng. plus basic as % of total manuf.		8.5	8.6	11.5	12.9	11.05%	11.47%	

Source: Survey of Industrial Production 1969, 1970, 1971, 1972, 1973, 1974.

Note: Labour costs incl. wages and salaries, contributions to providen and pension funds, gratuities and other benefits in cash or kind.

Table 5: **Gross Investment 1969 - 1974 (in Shs. mill. current prices)**

GROSS INVESTMENT

ISIC	Industrial Sector	1969	1970	1971	1972	1973	1974	% of Total Engineering only 1974
371	Basic Metal Ind.	1.6	6.4	5.3	3 & 11	21.5	6.5	
372	Incl. Rolling	1.6	6.4	5.3	3 & 11	21.5	6.5	
381	Fabricated metal products			3.0	5.05	4.95	7.4	46.59%
382	Machinery (other than electric)			0.7	1.4	1.6	1.28	8.06%
383	Electrical Mach., apparatus, appliances	4.1	7.2	0.7	2.02	2.67	2.4	15.11%
384	Transport Equipl	0.6	0.9	1.1	4.8	1.8	4.8	30.23%
Total Eng. plus metal		6.3	14.5	10.8	51.38	32.5	22.38	
Total eng. only		-	-	5.5	13.2	11.0	15.88	100.00%
Total All Manuf. Ind.		100.1	108.5	157.2	164.60	191.1	203.5	
Eng. plus basic as % of total Manuf.		6.3	13.3	6.9	31.2	17.02%	10.99%	

Source: Survey of Industrial Production 1969, 1970, 1971, 1972, 1973, 1974.

Note: Gross Investment consists of exp. on new fixed assets plus additions improvements and major alternations to fixed assets such as buildings, machinery and equipment.

Table 6 **Size Distribution of Engineering Establishments 1974**

No. of workers in Establishment	Fab. Metal products 381	Mech. M/C and equip. 382	Electr. M/C & Equip. 383	Transport Equip. 384	Total
	Number of Establishments				
500 and more	Nil	Nil	1	1	2
100 to 499	7	1	1	3	12
50 to 99	6	2	Nil	5	13
20 to 49	5	6	1	4	16
10 to 19	1	8	1	1	11
Total Number Establishments	19	17	4	14	54
Total Employed	2269	714	765	1580	5355
% of Total	42.4	13.8	14.3	29.5	

Source: Survey of Industrial Production 1974:

Table 7 **Geographical Distribution of Engineering Industries and Employment. 1974**

	COAST		TANGA		ARUSHA AND Kilimanjaro		MWANZA		TOTAL	TOTAL
	Nol Emp.	No. Est.	No. Emp.	No. Est.	No. Emp.	No. Est.	No. Emp.	No. Est.	Persons Engaged	Establishments
Fab. Metal product	1819	16	310	1	-	-	140	2	2269	19
Mech. Mach. and Equipment.	445	5	156	4	104	6	36	2	741	17
Elec. and equip.	599	2	-	-	133	1	33	1	765	4
Transport Equip.	1494	11	26	1	10	1	50	1	1580	14
No. of Employees	4354		492		247		506		5355	
No. of Estab.	3435			6		8		6		
% of Employees in each location	81.4%	9.2%			4.6%		9.4		100.00	

Source: Survey of Industrial Production 1974.

G-666

78.11.06